

**Title** of the student's work plan: Structural image recognition of a Pervasive System

**Objective(s)** of the Student Work Plan: Develop a structural image recognition method that identifies and reports the presence of certain elements in an image.

### **Abstract**

The project consists of a system that allows the user to detect elements of the environment around them, monitor the individual's signals, establish connectivity and trigger emergency actions. This gives autonomy to people with compromised vision who have their actions limited by the absence of vision.

This user's main characteristic is a severe visual impairment. Therefore, in this study, the focus is on detecting objects in the environment. Applications of this type are diverse, but all with the same objective: to guide the person to take the best actions. In other words, the main objective is to detect an object in the image to help the user in everyday life. Thus, an everyday application with a very practical aspect was listed, which is money detection.

Digital image processing, even more so with computer vision, is an automated way of checking and classifying patterns. In a program called MATLAB, digital image processing algorithms were initially created. These algorithms aim to detect at least 2 objects present in the image of the currency note in question to inform the output of its value (for example, informing in a text box or emitting a characteristic sound).

The work consisted on studying and implementing methods for identifying objects in images to help people with visual impairments. The objects consisted of obstacles or signs to direct those who have significant vision loss. Thus, the system could inform the user through a warning (e.g. sound) about the elements in front of them, increasing the user's perception of the environment. Several applications could be developed, from obstacle detection to value recognition. The process of recognizing standards consists of the following steps: acquisition, preprocessing, segmentation, feature extraction and image recognition and classification.

The acquisition aims to obtain an image using some device (photography camera, x-ray, ultrasound, etc.). Preprocessing prepares the image for the following steps, correcting defects and highlighting the details of interest. Segmentation fragments the image into several independent parts to facilitate attribute extraction. At this stage, the contours distinguish regions that constitute the objects in the image. Attribute extraction identifies image objects and their characteristics.

Finally, in the recognition and classification stage, the characteristics of all identified objects were interpreted to distinguish the object in question from several others. In this work, syntactic methods that depend on structural information to describe each pattern to be recognized were addressed. The acquisition stage was carried out using a camera. In pre-processing, it was the color image was converted to gray scale and then the image filtering to remove noise. The image segmentation was carried out immediately using methods based on the topological gradient and the "watershed" transformation. In the attribute extraction steps, image recognition and classification, morphological methods were used.